In spite of some minor things which seem inseparable from originality, this work is of the first quality and should be in the hands of every plant pathologist. —H. A. HARDING.

MINOR NOTICES.

Grasses of Iowa.— As a supplementary report for 1803 the Iowa Geological Survey issues part II of the *Grasses of Iowa*,[2] prepared by PAMMEL, BALL, SCRIBNER, and others. This is a descriptive and geographical study of the grasses of the state, their general and economic aspects having been treated in part I. Under each genus there is the generic description, with synonymy, a key to the species, a description of the species, often a figure, a list of localities and a map showing the distribution of each form in the state, and a statement of distribution in North America and elsewhere. There is a chapter on physiography and geology, with a map, a section on ecology, and a partial bibliography of works on grasses. The work seems very complete and should be especially serviceable to Iowa botanists. It is a pity state printers are so seldom skilful book-makers.—C. R. B.

Connecticut fungi.— The recently established natural history survey of Connecticut has begun to show results, in the publication of two bulletins listing the Hymeniales and Ustilagineae of the state. The former[3] lists 375 species in 65 genera, gives analytic keys to the genera, and illustrates the commoner species by admirable half-tones, most of which are original. The species of smuts[4] are described with lists of hosts and distribution, and notes on economic features.— C. R. B.

NOTES FOR STUDENTS.

Photosynthesis and temperature.—The interesting results of Miss MATTHAEI on temperature as a limiting factor for photosynthesis[5] have now been extended by her work in cooperation with BLACKMAN.[6] They have endeavored to interpret the quantitative variations of photosynthesis, under approximately natural conditions, in terms of the three limiting factors thereto, viz. (1) intensity of illumination, (2) temperature of leaf, (3) pressure of CO_2. When a leaf is

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[2] PAMMEL, L. H., BALL, C. R., and SCRIBNER, F. L. The grasses of Iowa. Part II, Iowa Geological Survey, supplementary report. 1903. 8vo. pp. xiv + 436, *figs. 270.* Des Moines, Iowa. 1904.

[3] WHITE, E. A., A preliminary report on the Hymeniales of Connecticut. State Geol. and N. H. Survey Bulletin 3. 8vo. pp. 81. *pls. 40.* 1905.

[4] CLINTON, G. P., The Ustilagineae or smuts of Connecticut. Idem, Bull. 5. 8vo, *pp. 45. figs. 55.* 1905.

[5] See BOT. GAZETTE **38** : 476. 1904.

[6] BLACKMAN, F. F., and MATTHAEI, G. L. C., Experimental researches in vegetable assimilation and respiration. IV. A quantitative study of carbon dioxide assimilation and leaf temperature in natural illumination. Proc. Roy. Soc. London B. **76**: 402–460. 1905.

exposed to diffuse daylight alone the amount of photosynthesis is a measure of the light, and it varies with varying light only when the amount of carbon dioxid in the atmosphere is artificially increased and the temperature is kept high. If not, photosynthesis is limited thereby and is constant though the light vary. Isolated leaves may rise more than 10° C. above a bright mercury thermometer in the sun, a result quite at variance with BROWN and ESCOMBE'S results,[7] which, however, were calculated, not observed. Further study of this point is needed.

At normal temperature leaves are not able to utilize the full amount of energy absorbed; helianthus could reach its maximum at 29° C. with about 68 per cent. full sunlight and cherry laurel with about 36 per cent. When light is the limiting factor equal intensities produce equal photosynthesis with leaves of most various structure and type. At low temperatures leaves as different as helianthus and cherry laurel have similar photosynthetic maxima, but at high temperatures these diverge. Thus at 29.5° C. the former can fix twice as much CO_2 as the latter, requiring twice as much energy to do it, of course. The essential difference in the photosynthetic activity in different leaves lies, then, in that they have different coefficients of acceleration of this function with increasing temperature. So in nature it appears that the low pressure of CO_2 (entailing slow diffusion after solution at the surfaces of the leaf cells) and the low temperatures are the serious impediments to food making.—C. R. B.

Root tubercle cultures.—Much interest has been excited during very recent years by work done in the Department of Agriculture concerning soil inoculation with various root tubercle bacteria. Widespread and rather unfortunate notoriety has been given to the work by numerous popular magazine and newspaper articles, and the impression has been gained by the public that nearly all knowledge concerning the root tubercle is to be attributed to the recent investigations conducted in the Department. This popular impression is of course erroneous. The two distinctive contributions to this subject claimed by the workers in the Department of Agriculture were that the nitrogen-gathering ability of the bacteria was heightened by new cultural methods, and that a method of transportation in dried condition, upon cotton, had been devised, whereby pure cultures could be distributed readily to farmers.

Much skepticism has existed concerning the possibility of practically heightening the nitrogen-gathering power of the bacteria, and in a recent bulletin[8] HARDING and PRUCHA claim to have demonstrated by an examination of eighteen of these cotton cultures that such packages are worthless for practical purposes since the organisms are unable to survive upon the cotton or survive in such small numbers as to be practically valueless. "Substantially identical results upon six of these packages were obtained in five separate laboratories," and the reviewer may add that similar results were obtained in his own

[7] See BOT. GAZETTE **40** : 473. 1905.

[8] HARDING, H. A., and PRUCHA, N. J., The quality of commercial cultures for legumes. N. Y. Agr. Exp. Sta. Bull. **270**:345–385. 1905.